OIPE JC1689
NOV 2 6 2004
PATENT & TRADEMARK OFFICE

Rader, Fishman & Grauer PLLC (248) 594-0600
Inventor: Richardson et al. Filed: 03/11/2004
Title: PACKET NETWORK MONITORING DEVICE
Attorney: Michael B. Stewart

REPLACEMENT DRAWINGS

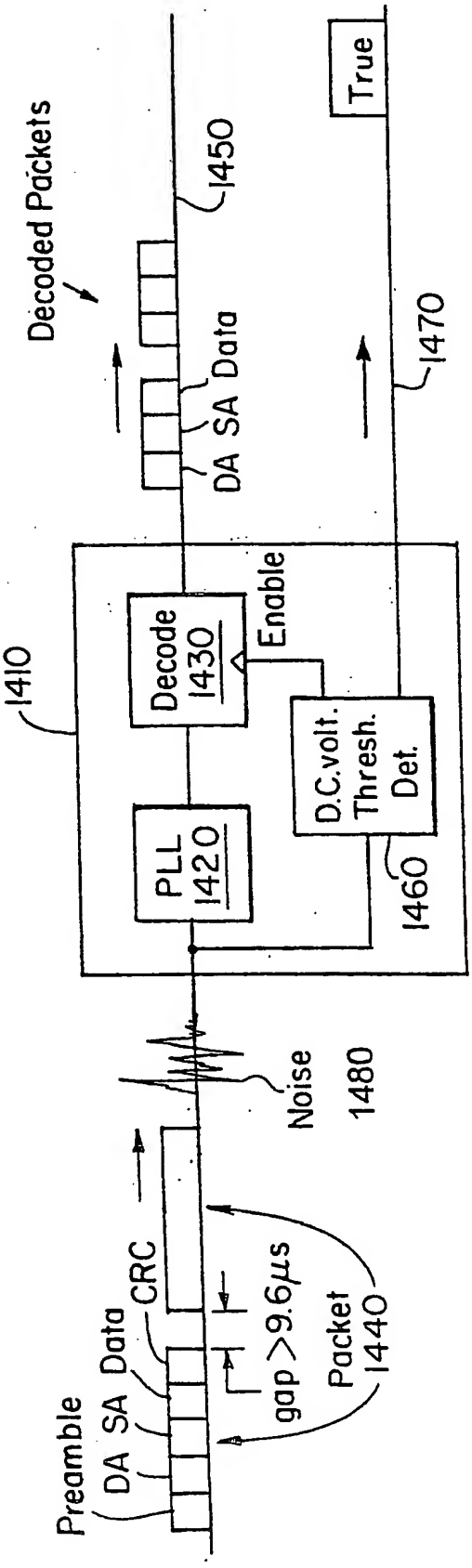


FIG. 1
Prior Art

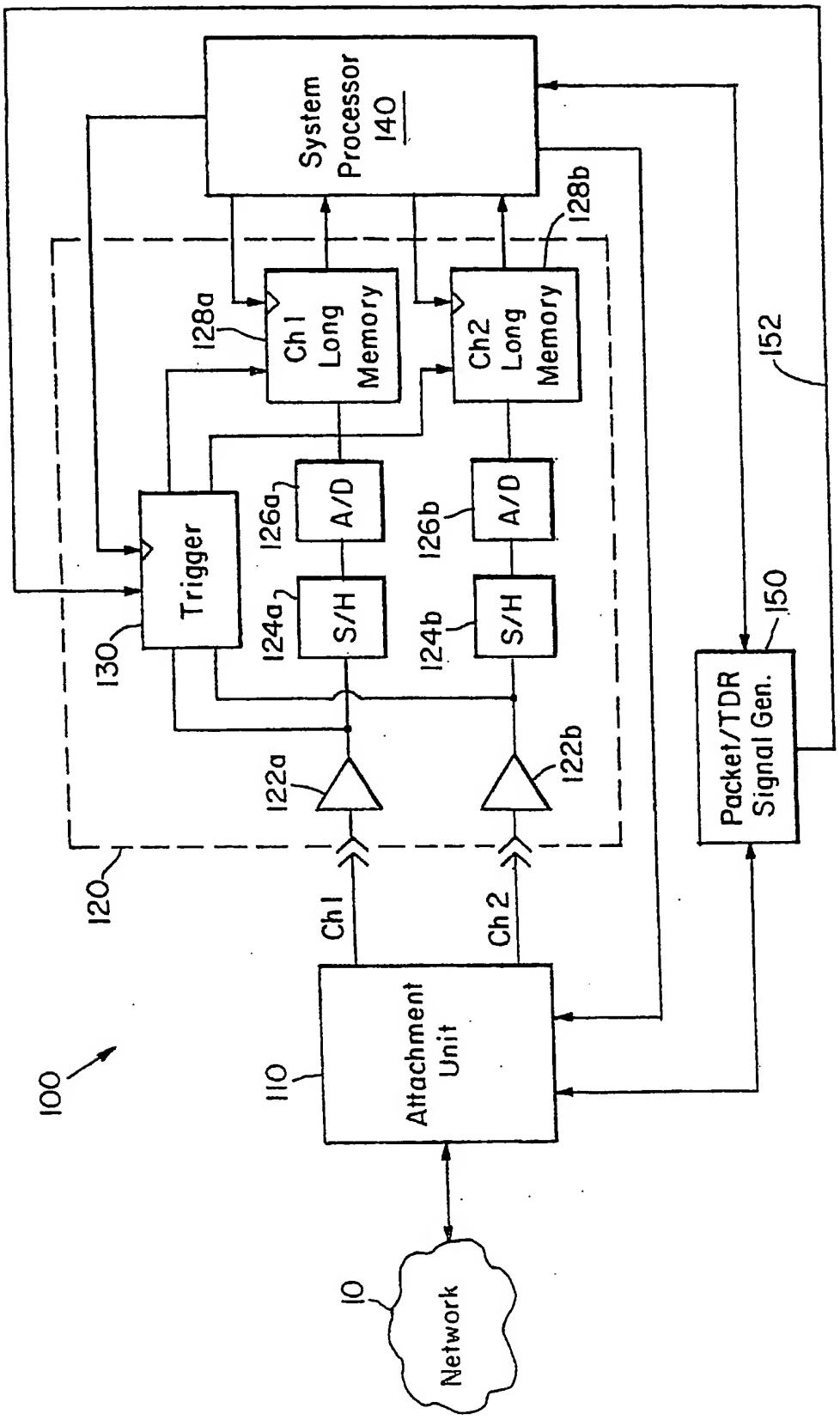

System Processor 140
128b
128a
Ch1 Long Memory
Ch2 Long Memory
152
126a
A/D
126b
A/D
Trigger
124a
S/H
124b
S/H
130
150
Packet/TDR Signal Gen.
122a
122b
120
Ch1
Ch2
Attachment Unit
110
100
10
Network

FIG. 2

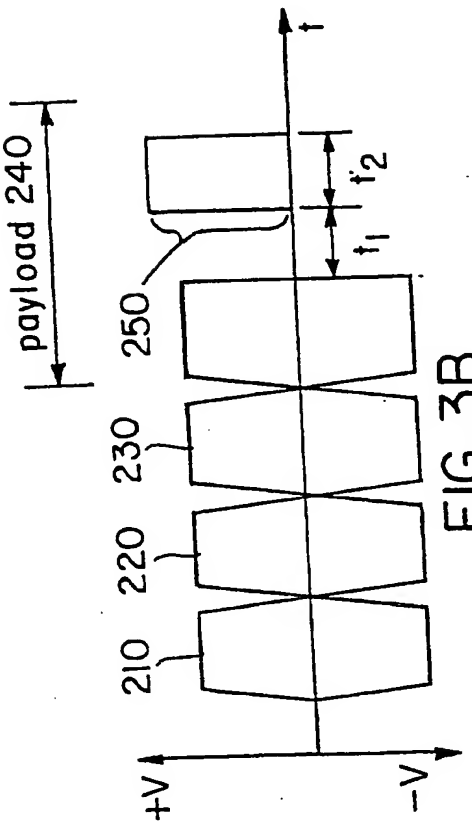


FIG. 3B

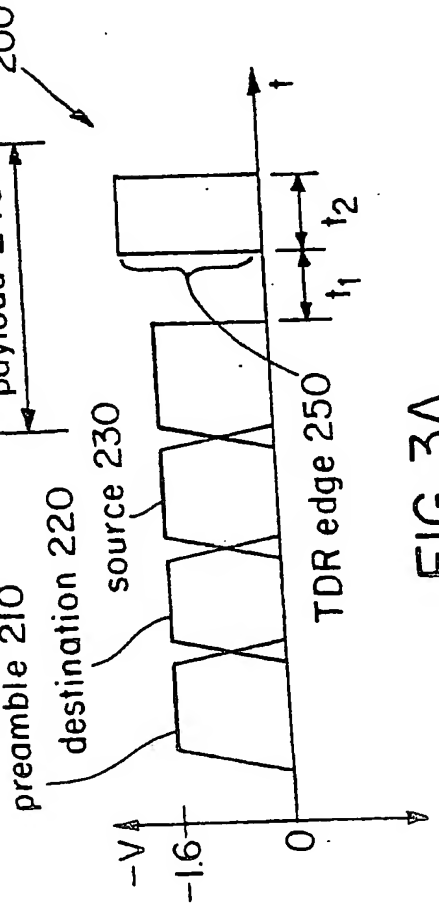


FIG. 3A

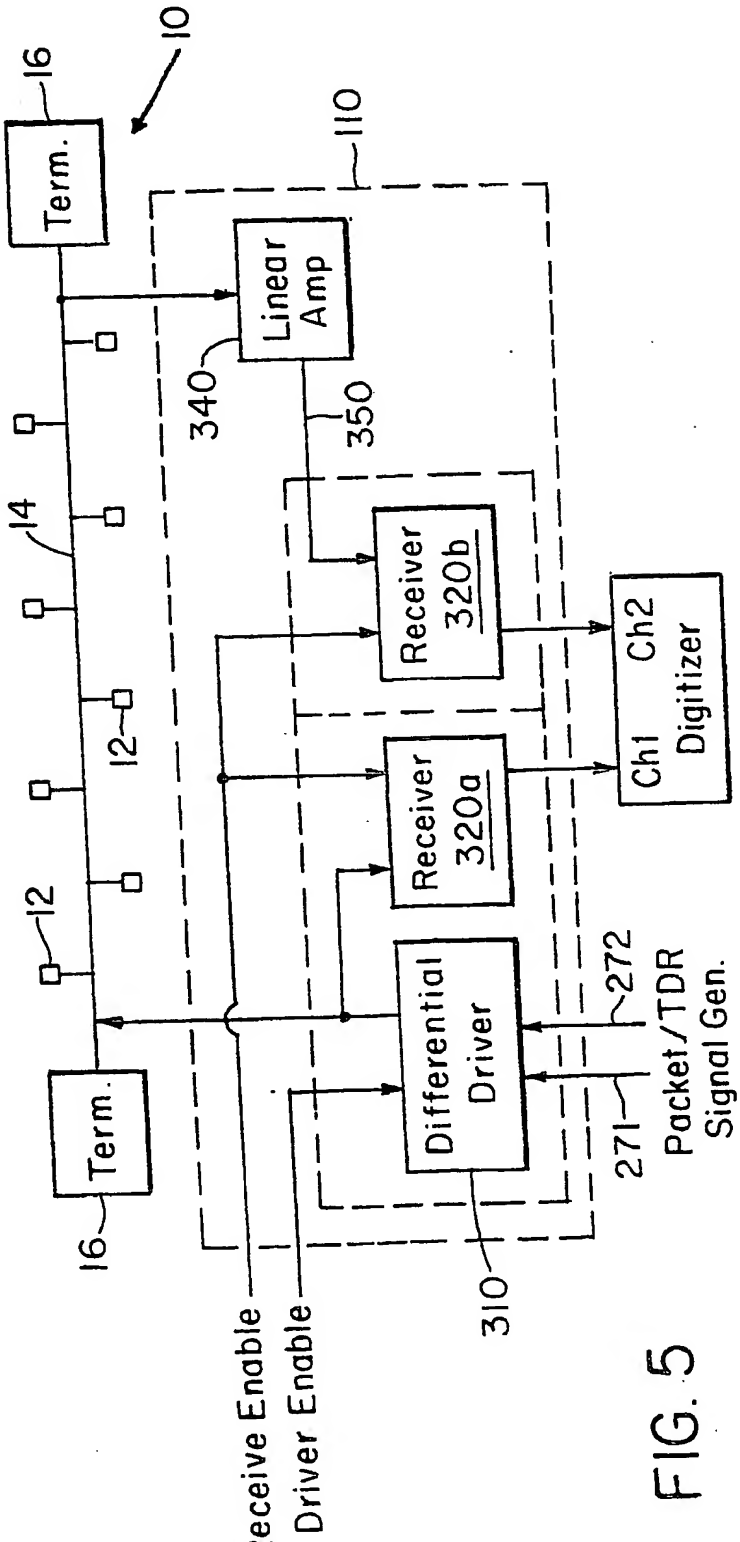


FIG. 5

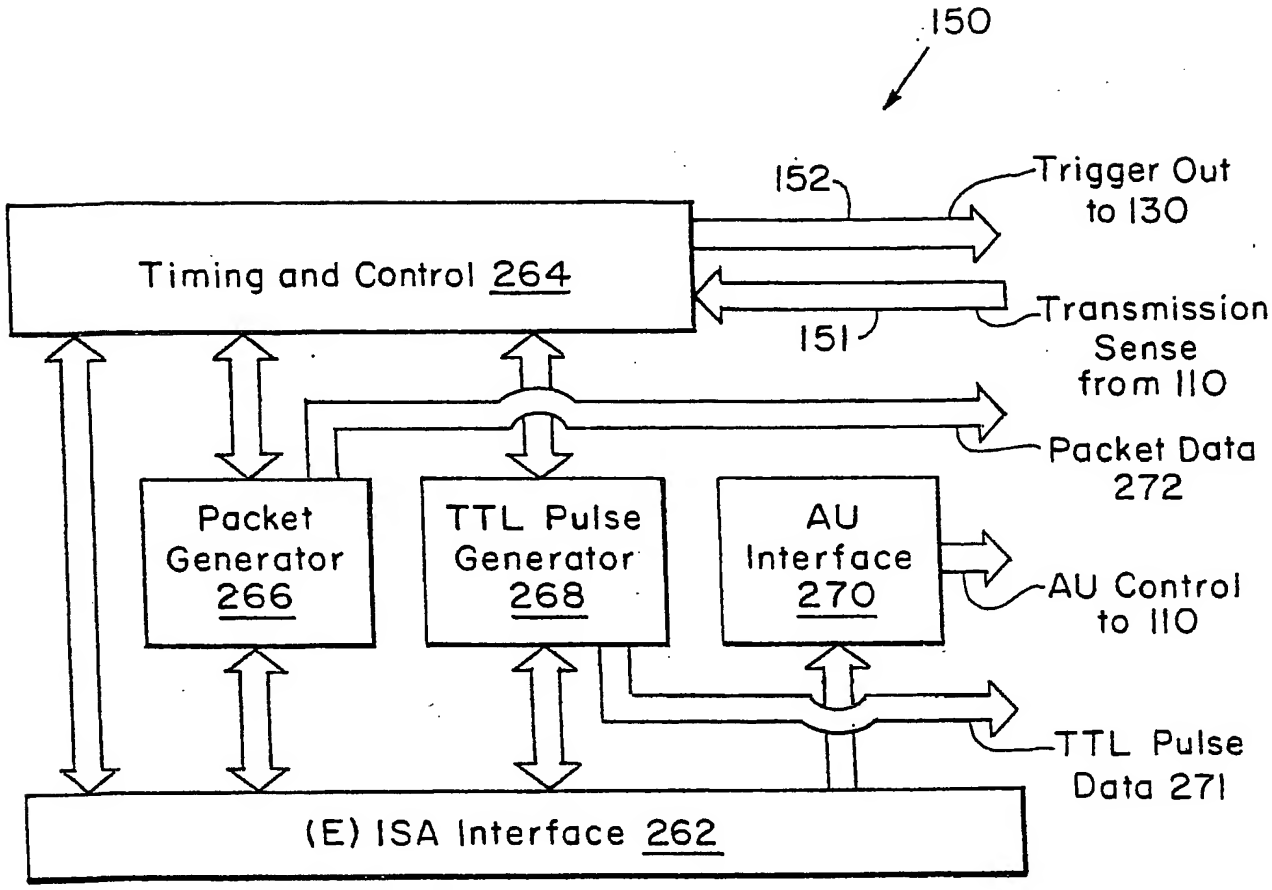

150
152
Trigger Out to 130
Timing and Control 264
151
Transmission Sense from 110
Packet Data 272
Packet Generator 266
TTL Pulse Generator 268
AU Interface 270
AU Control to 110
TTL Pulse Data 271
(E) ISA Interface 262

FIG. 4A

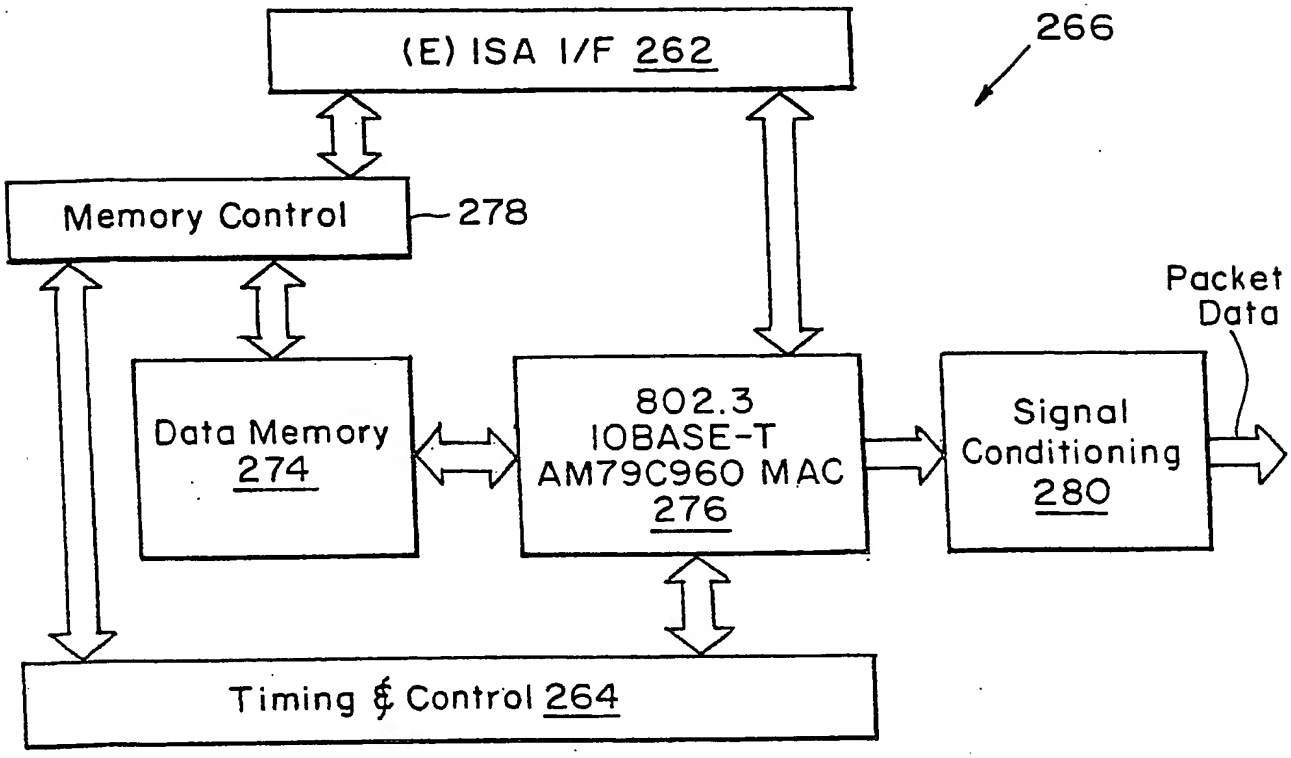

(E) ISA I/F 262
266
Memory Control
278
Packet Data
Data Memory 274
802.3 10BASE-T AM79C960 MAC 276
Signal Conditioning 280
Timing & Control 264

FIG. 4B

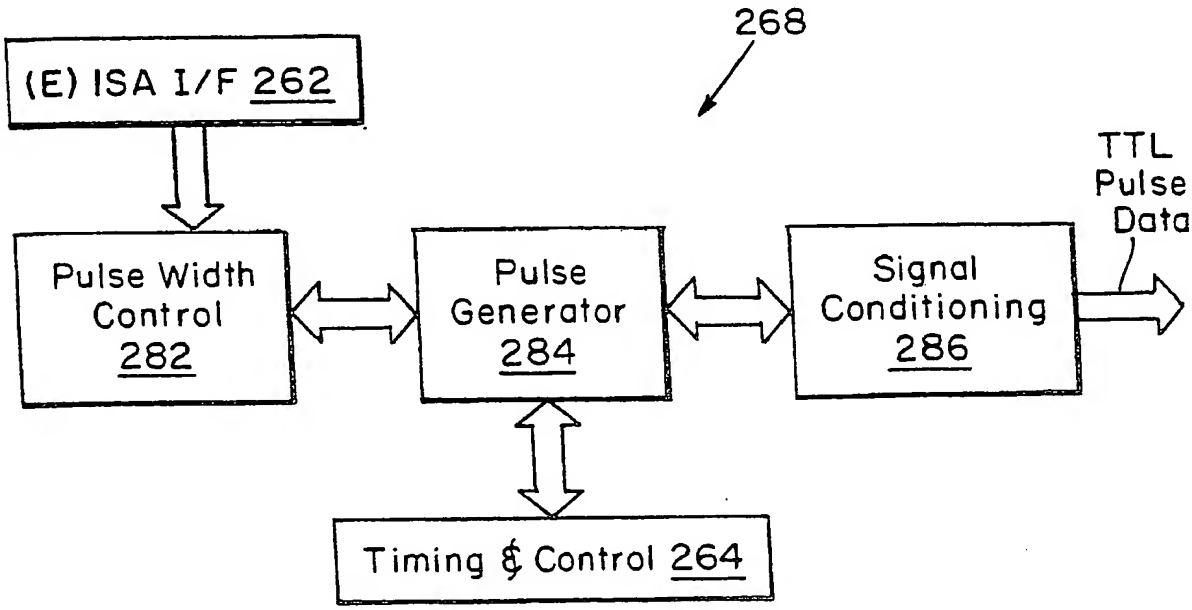

268
(E) ISA I/F 262
TTL Pulse Data
Pulse Width Control 282
Pulse Generator 284
Signal Conditioning 286
Timing & Control 264

FIG. 4C

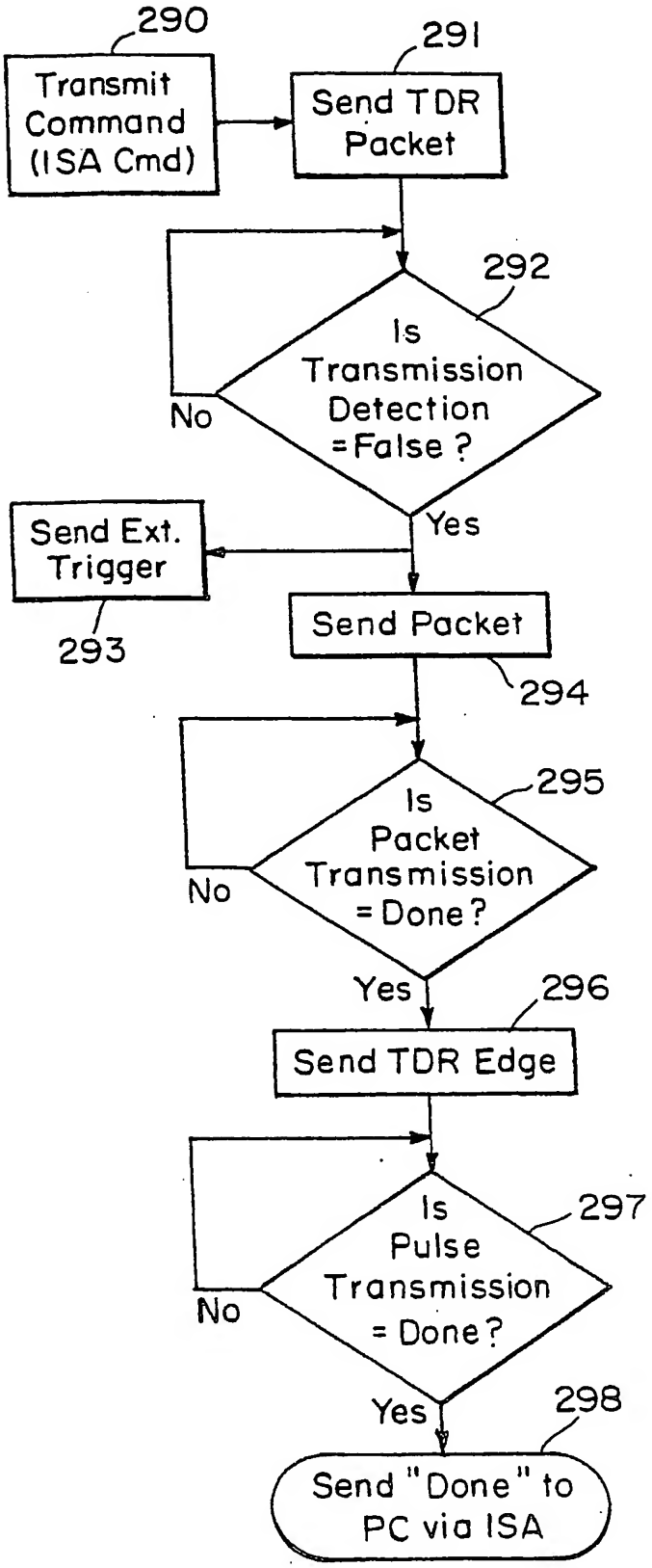

290
Transmit Command (ISA Cmd)
291
Send TDR Packet
292
Is Transmission Detection = False ?
No
Yes
Send Ext. Trigger
293
Send Packet
294
295
Is Packet Transmission = Done?
No
Yes
296
Send TDR Edge
297
Is Pulse Transmission = Done?
No
Yes
298
Send "Done" to PC via ISA

FIG. 4D

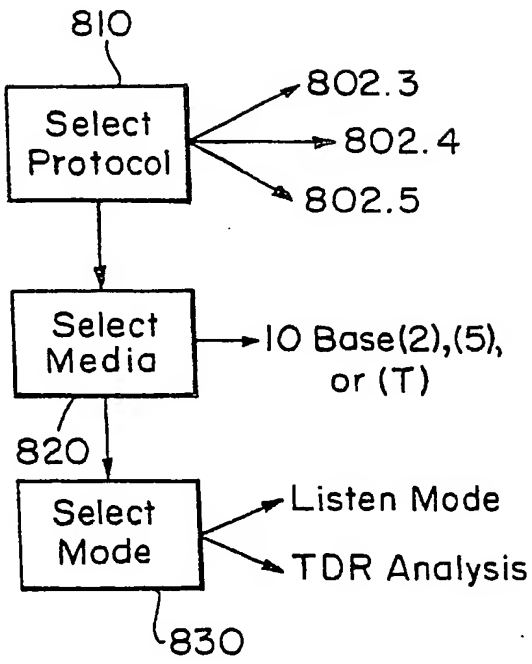

810
Select Protocol
802.3
802.4
802.5
Select Media
10 Base(2),(5), or (T)
820
Select Mode
Listen Mode
TDR Analysis
830

FIG. 11

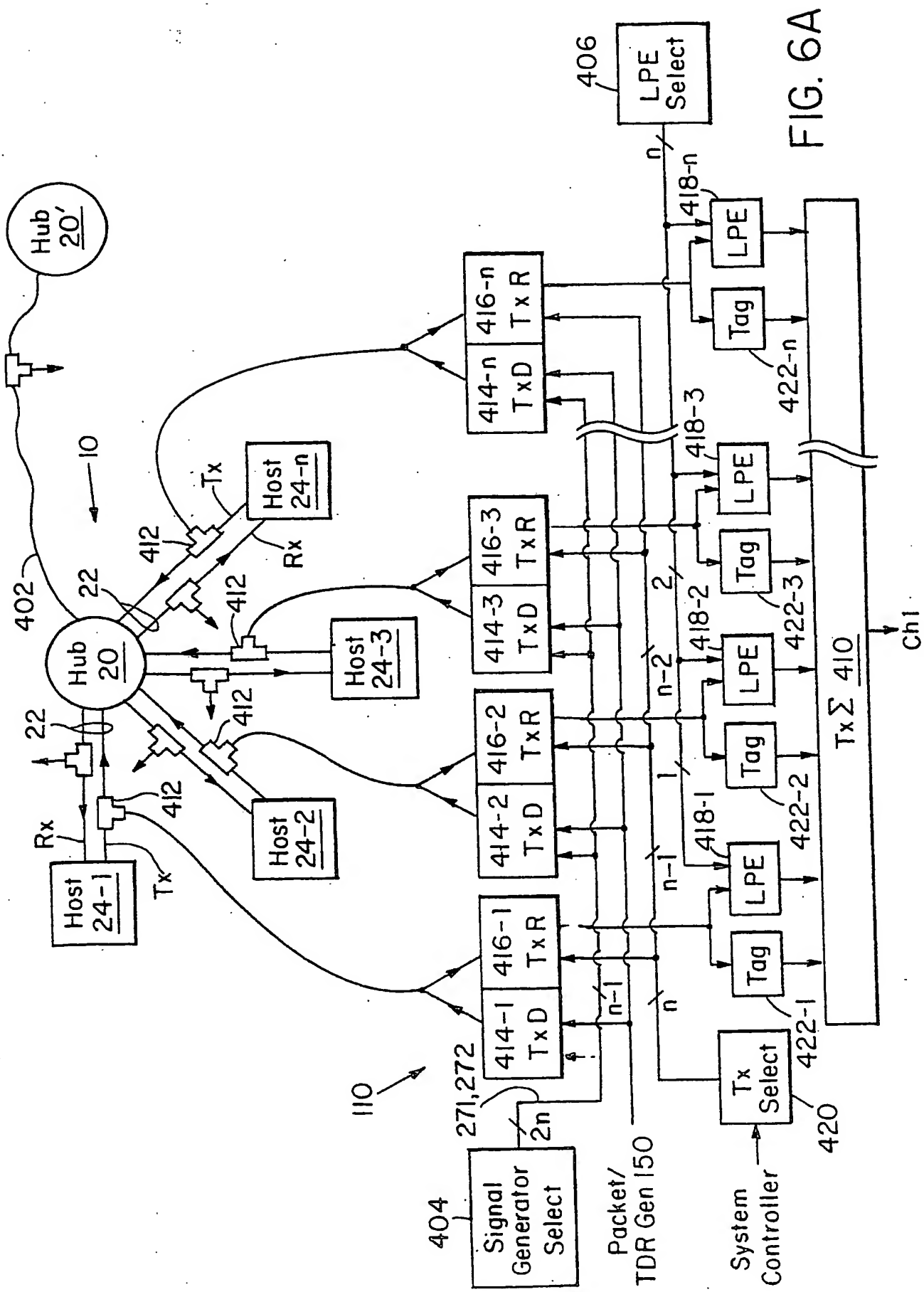

Hub 20'
10
402
Hub 20
22
Host 24-1
Host 24-2
Host 24-3
Host 24-n
Rx
Tx
412
110
271,272
2n
404
Signal Generator Select
Packet/ TDR Gen 150
System Controller
406
LPE Select
n
n-1
n-2
2
1
414-1 TxD
414-2 TxD
414-3 TxD
414-n TxD
416-1 TxR
416-2 TxR
416-3 TxR
416-n TxR
418-1
418-2
418-3
418-n
LPE
Tag
422-1
422-2
422-3
422-n
Tx Select
420
TxΣ 410
Ch1

FIG. 6A

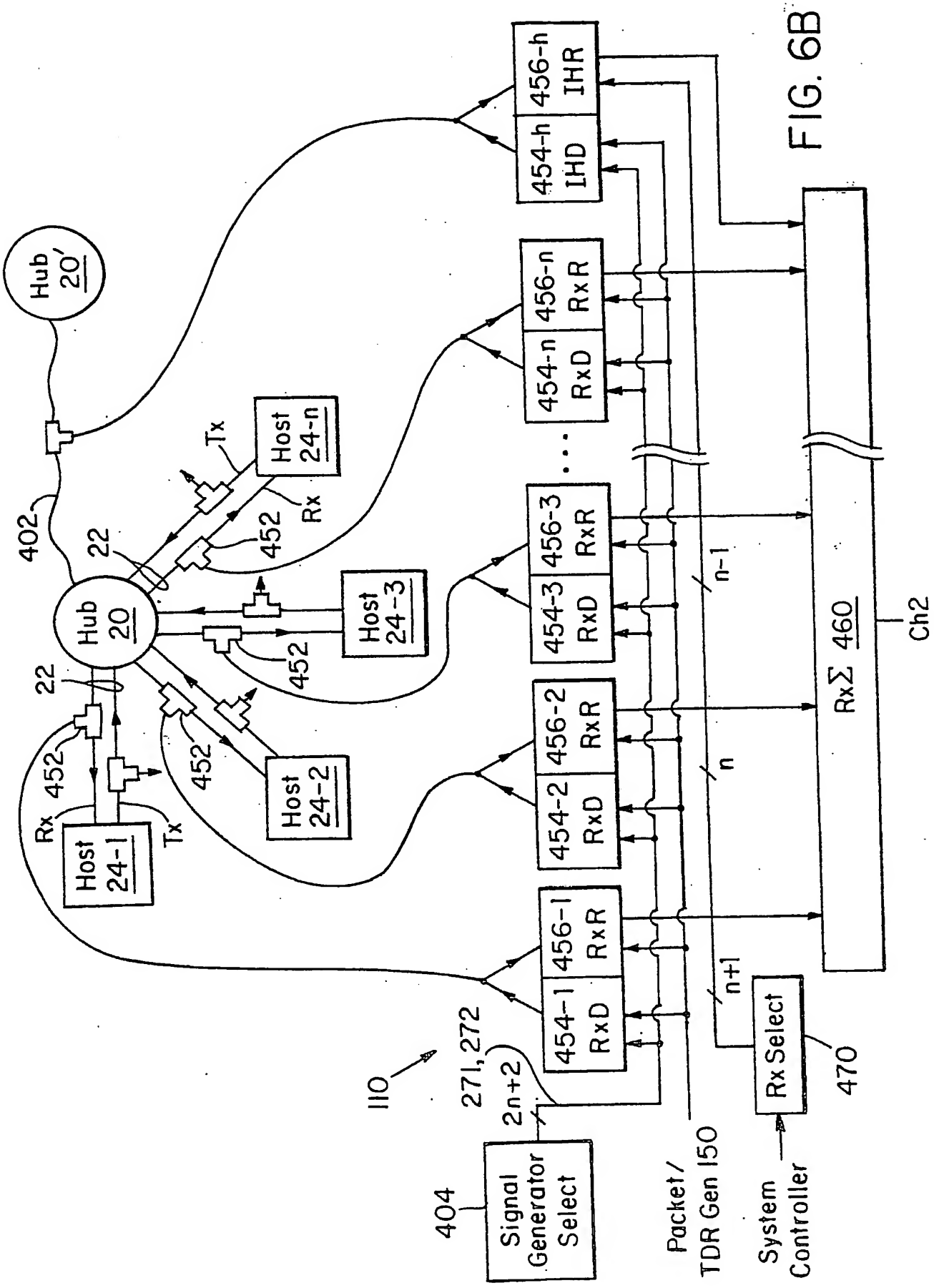

Hub 20'
Hub 20
402
22
Host 24-1
Host 24-2
Host 24-3
Host 24-n
Tx
Rx
452
454-1 RxD
456-1 RxR
454-2 RxD
456-2 RxR
454-3 RxD
456-3 RxR
454-n RxD
456-n RxR
454-h IHD
456-h IHR
n-1
n
n+1
RxΣ 460
Ch2
Rx Select
470
110
271, 272
2n+2
404
Signal Generator Select
Packet/ TDR Gen 150
System Controller

FIG. 6B

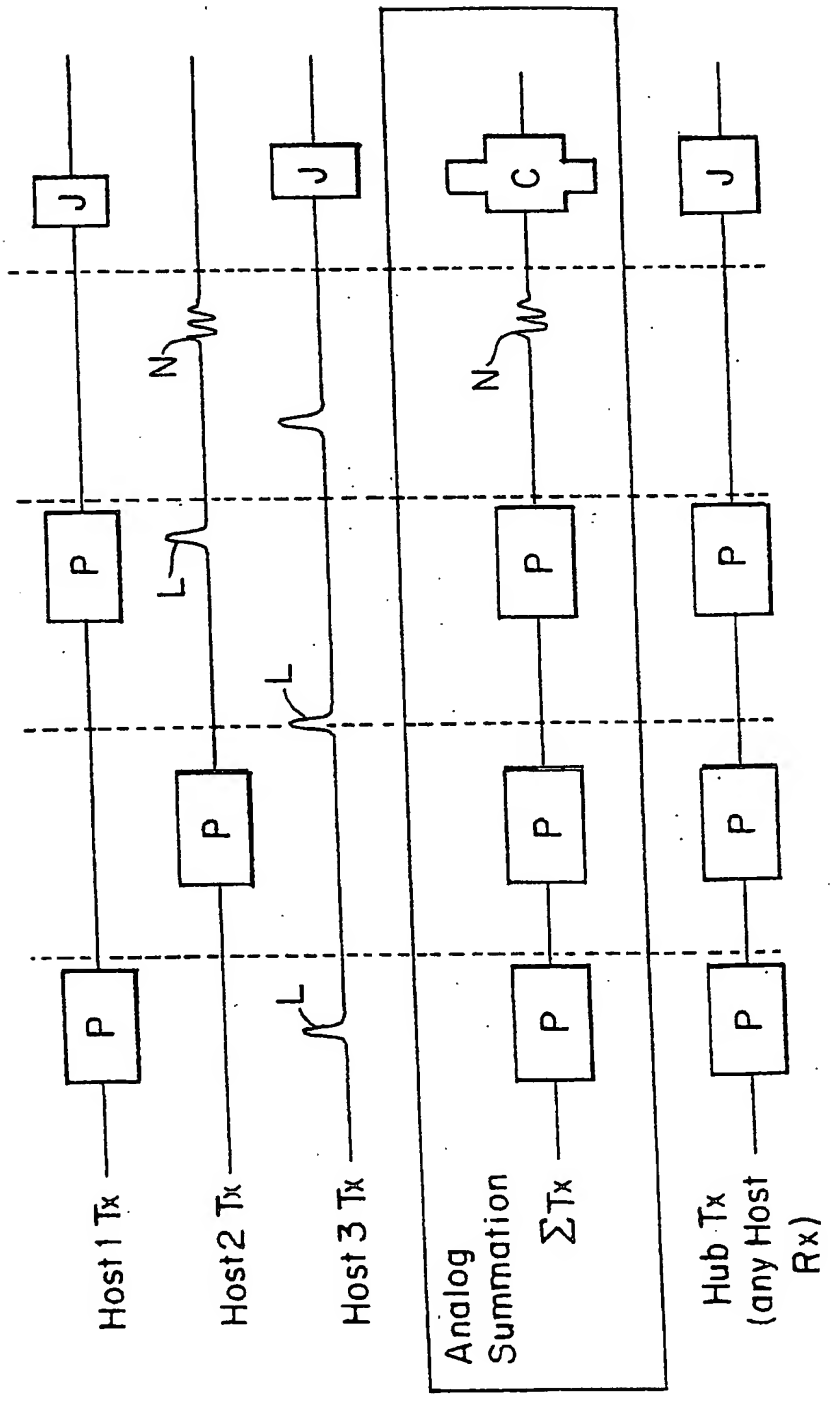

J
J
C
J
N
N
P
P
P
L
L
L
P
P
P
P
P
P
Host 1 Tx
Host2 Tx
Host 3 Tx
Analog Summation
ΣTx
Hub Tx (any Host Rx)

FIG. 7

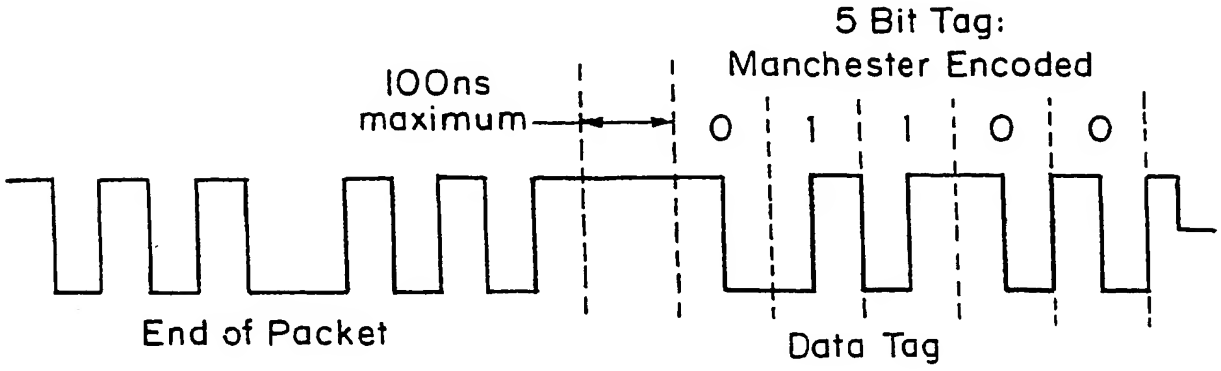


FIG. 8A

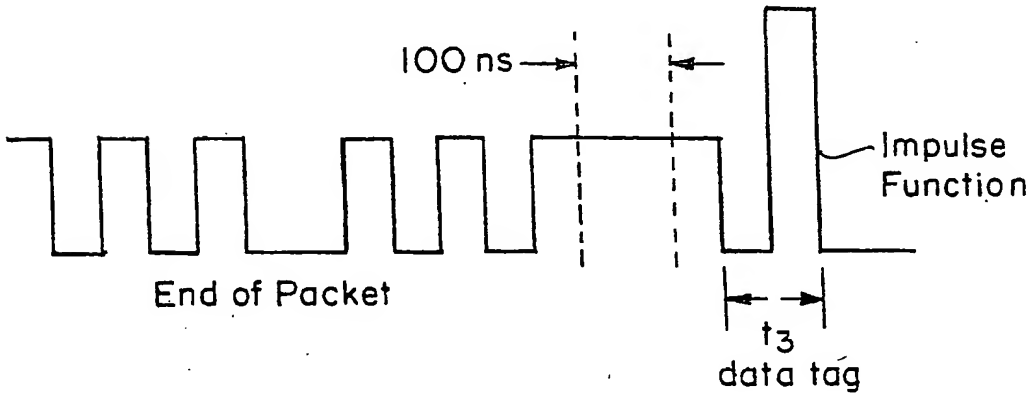


FIG. 8B

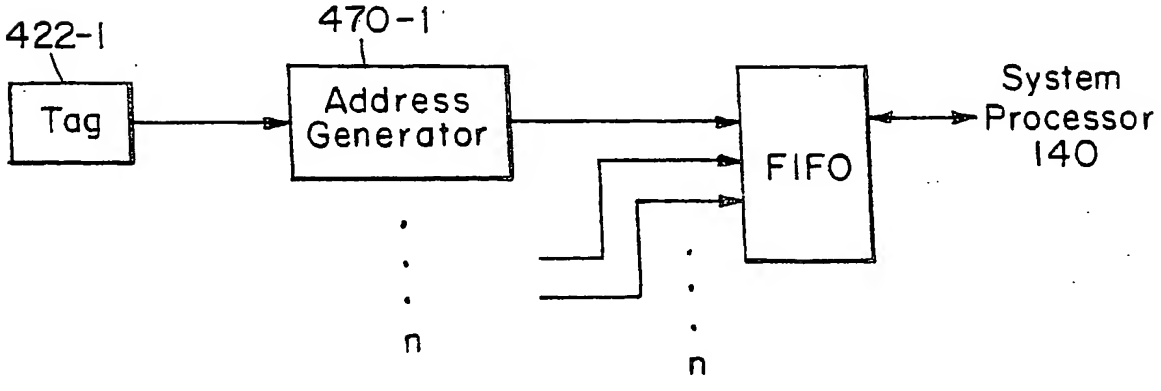


FIG. 8C

FIG. 9

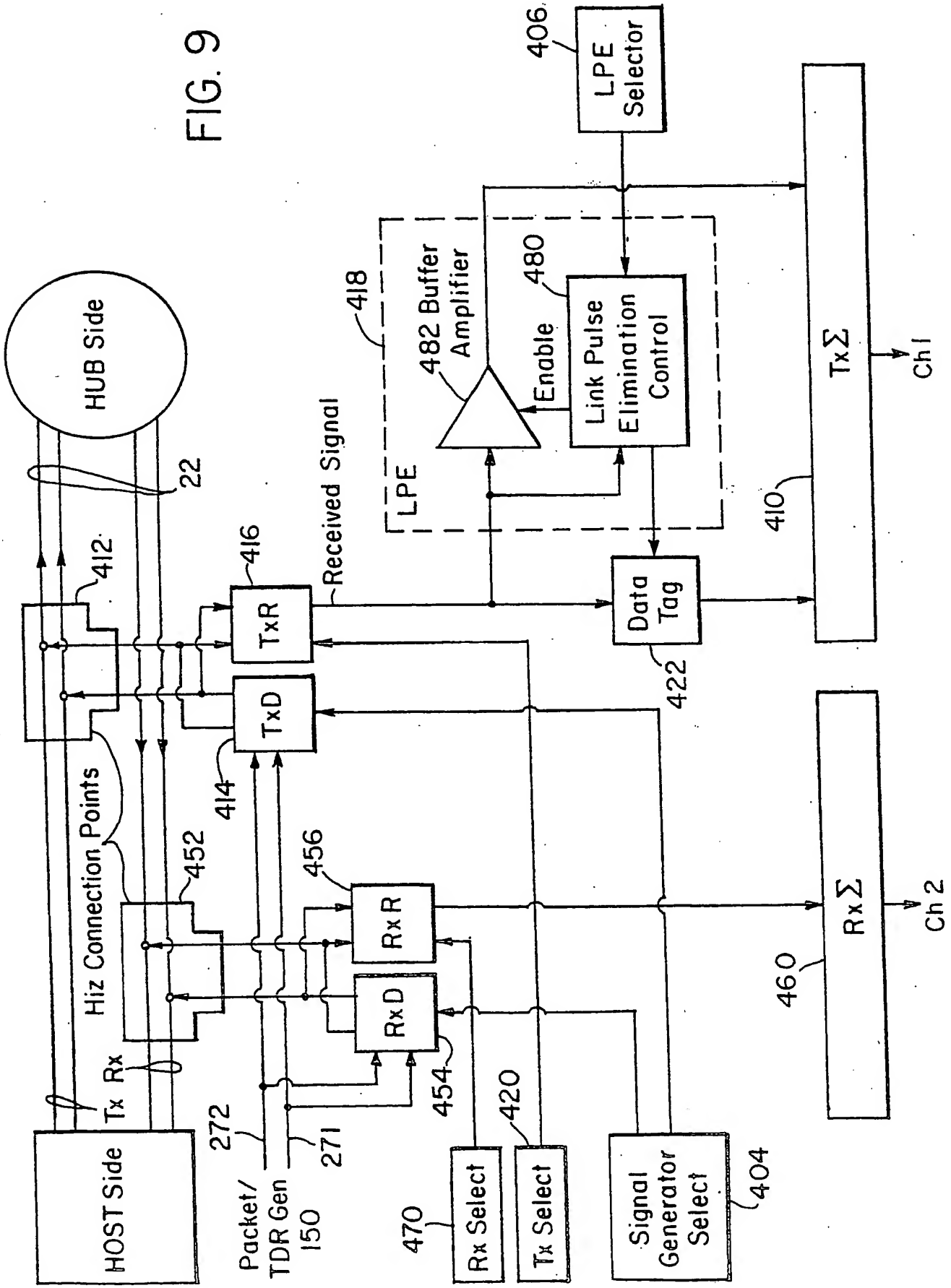
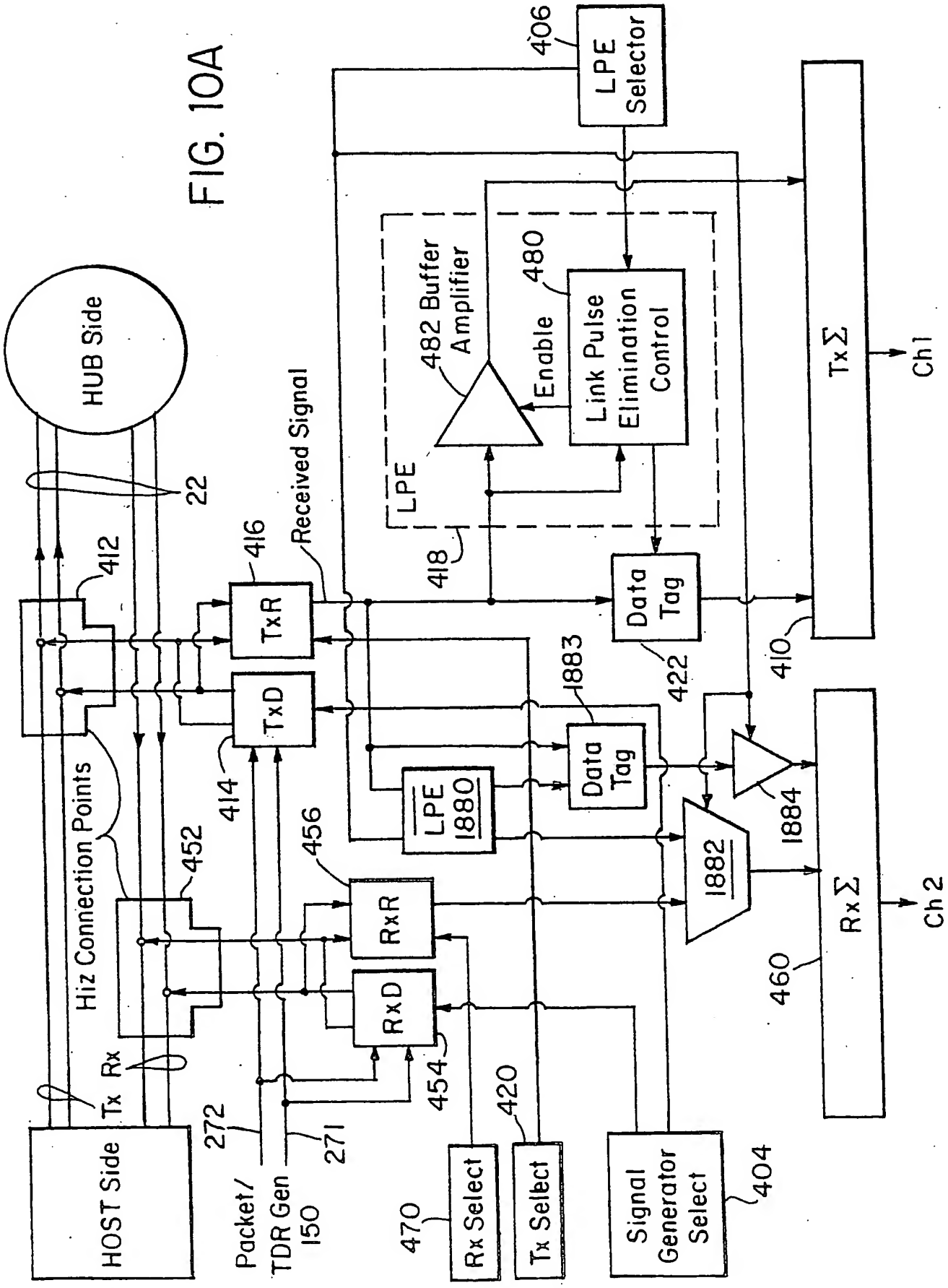

HUB Side
22
412
416
TxR
Received Signal
418
LPE
482 Buffer Amplifier
Enable
480
Link Pulse Elimination Control
406
LPE Selector
TxΣ
Ch 1
410
Data Tag
422
TxD
414
Hiz Connection Points
452
456
RxR
RxD
454
RxΣ
Ch 2
460
Tx Rx
272
271
Packet/ TDR Gen 150
HOST Side
470
Rx Select
420
Tx Select
Signal Generator Select
404

FIG. 10A


HUB Side
HOST Side
Tx Rx
22
Hiz Connection Points
452
412
416
TxR
TxD
414
Received Signal
456
RxR
RxD
454
272
271
Packet/
TDR Gen
150
420
Tx Select
470
Rx Select
404
Signal
Generator
Select
LPE
418
482 Buffer
Amplifier
Enable
480
Link Pulse
Elimination
Control
406
LPE
Selector
Data
Tag
422
1883
Data
Tag
LPE
1880
1882
1884
410
Tx Σ
Ch 1
460
Rx Σ
Ch 2

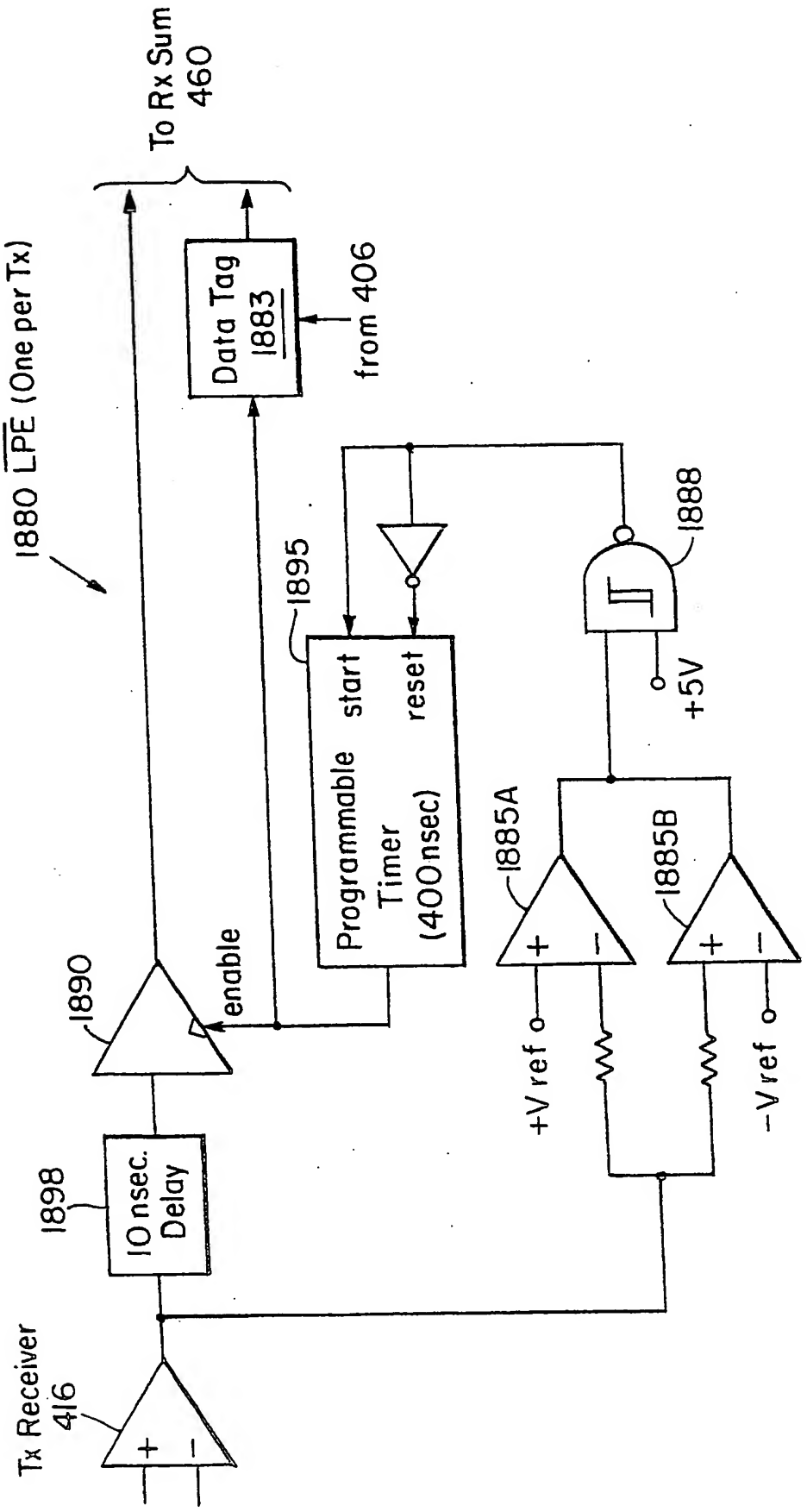

To Rx Sum 460
Data Tag 1883
from 406
1880 $\overline{LPE}$ (One per Tx)
1895
1888
Programmable Timer (400nsec)
start
reset
+5V
1885A
1885B
1890
enable
+V ref
-V ref
1898
10 nsec. Delay
Tx Receiver 416

FIG. 10B

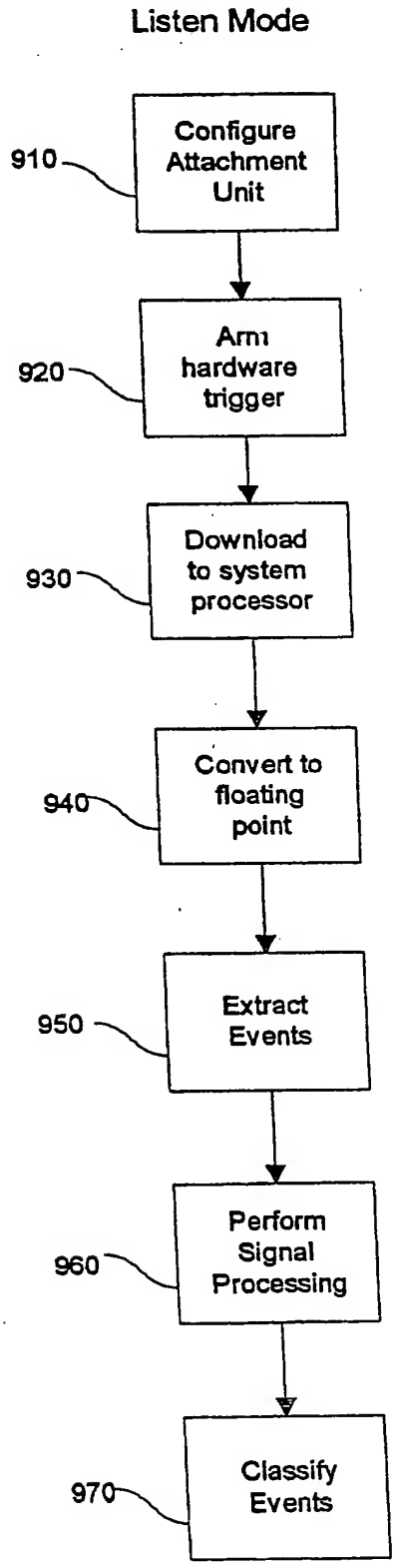

Listen Mode
910
Configure Attachment Unit
920
Arm hardware trigger
930
Download to system processor
940
Convert to floating point
950
Extract Events
960
Perform Signal Processing
970
Classify Events

FIG. 12

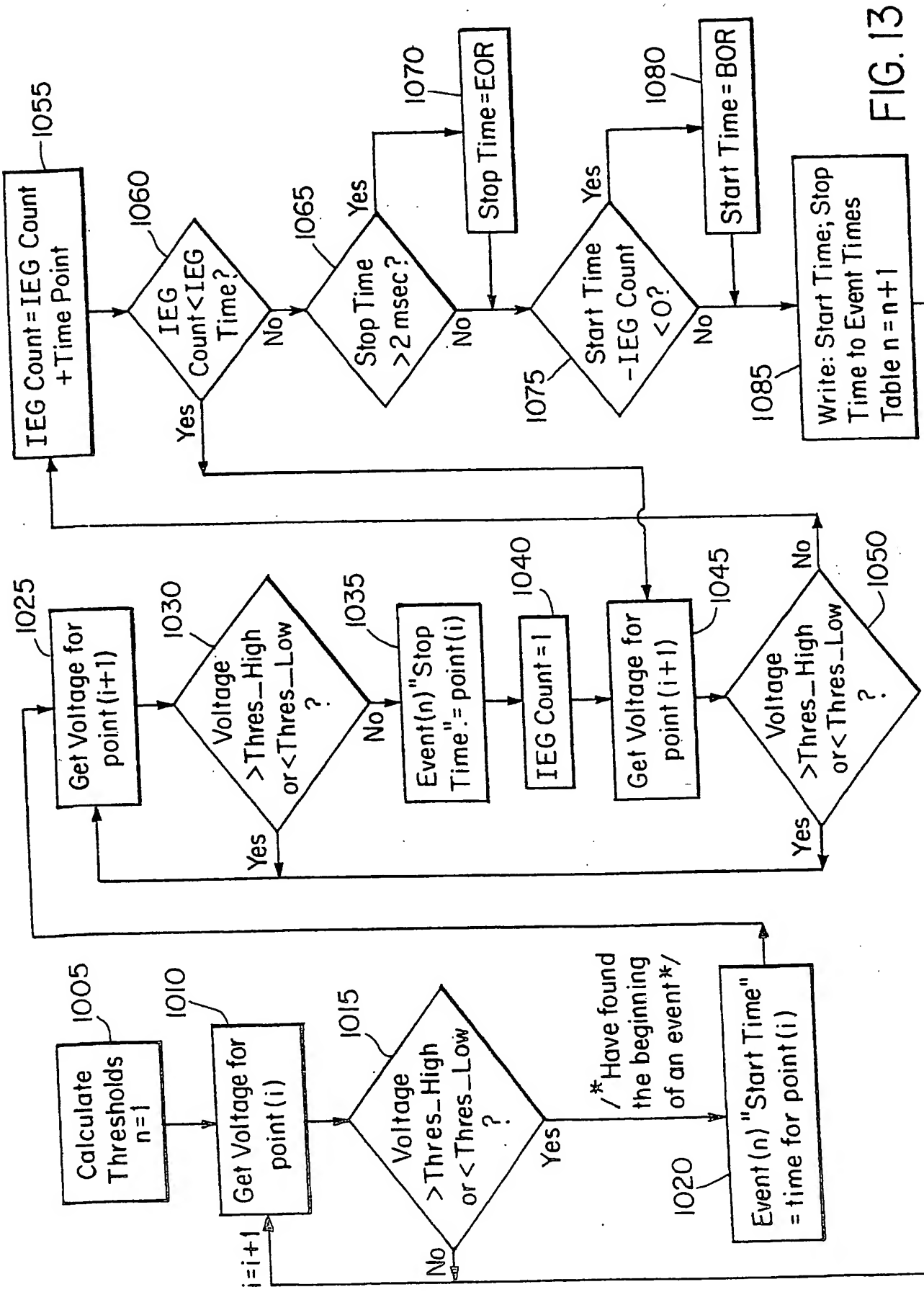

Calculate Thresholds n=1
1005
Get Voltage for point (i)
1010
Voltage >Thres_High or <Thres_Low ?
1015
Yes
No
i=i+1
/*Have found the beginning of an event*/
Event (n) "Start Time" = time for point (i)
1020
Get Voltage for point (i+1)
1025
Voltage >Thres_High or <Thres_Low ?
1030
No
Yes
Event (n) "Stop Time" = point (i)
1035
IEG Count = 1
1040
Get Voltage for point (i+1)
1045
Voltage >Thres_High or <Thres_Low ?
1050
No
Yes
IEG Count = IEG Count + Time Point
1055
IEG Count < IEG Time?
1060
No
Yes
Stop Time > 2 msec?
1065
Yes
No
Stop Time = EOR
1070
Start Time - IEG Count <0?
1075
Yes
No
Start Time = BOR
1080
Write: Start Time; Stop Time to Event Times Table n = n+1
1085

FIG. 13

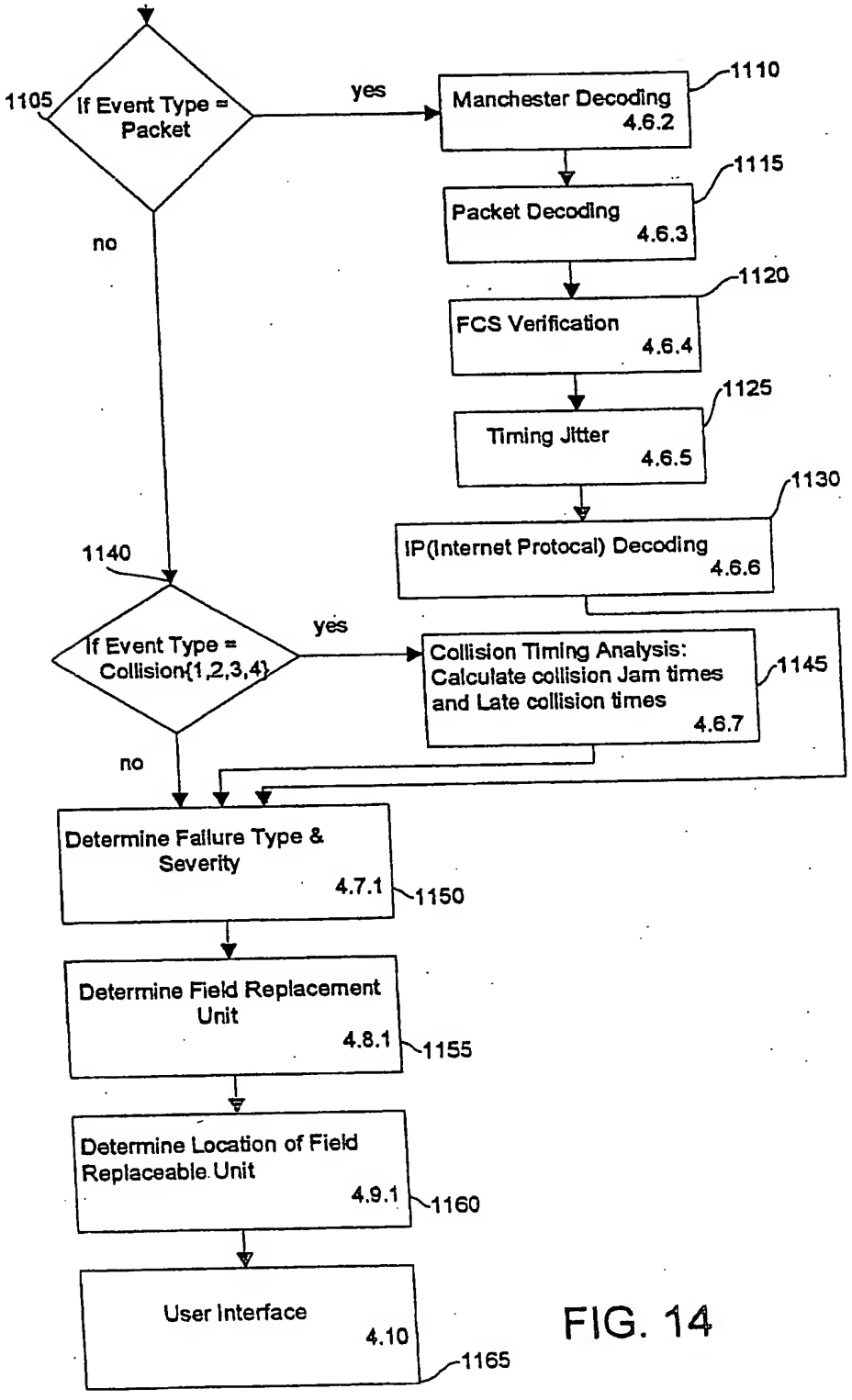

1105
If Event Type = Packet
yes
Manchester Decoding 4.6.2
1110
Packet Decoding 4.6.3
1115
FCS Verification 4.6.4
1120
Timing Jitter 4.6.5
1125
IP(Internet Protocal) Decoding 4.6.6
1130
no
1140
If Event Type = Collision{1,2,3,4}
yes
Collision Timing Analysis: Calculate collision Jam times and Late collision times 4.6.7
1145
no
Determine Failure Type & Severity 4.7.1
1150
Determine Field Replacement Unit 4.8.1
1155
Determine Location of Field Replaceable Unit 4.9.1
1160
User Interface 4.10
1165

FIG. 14

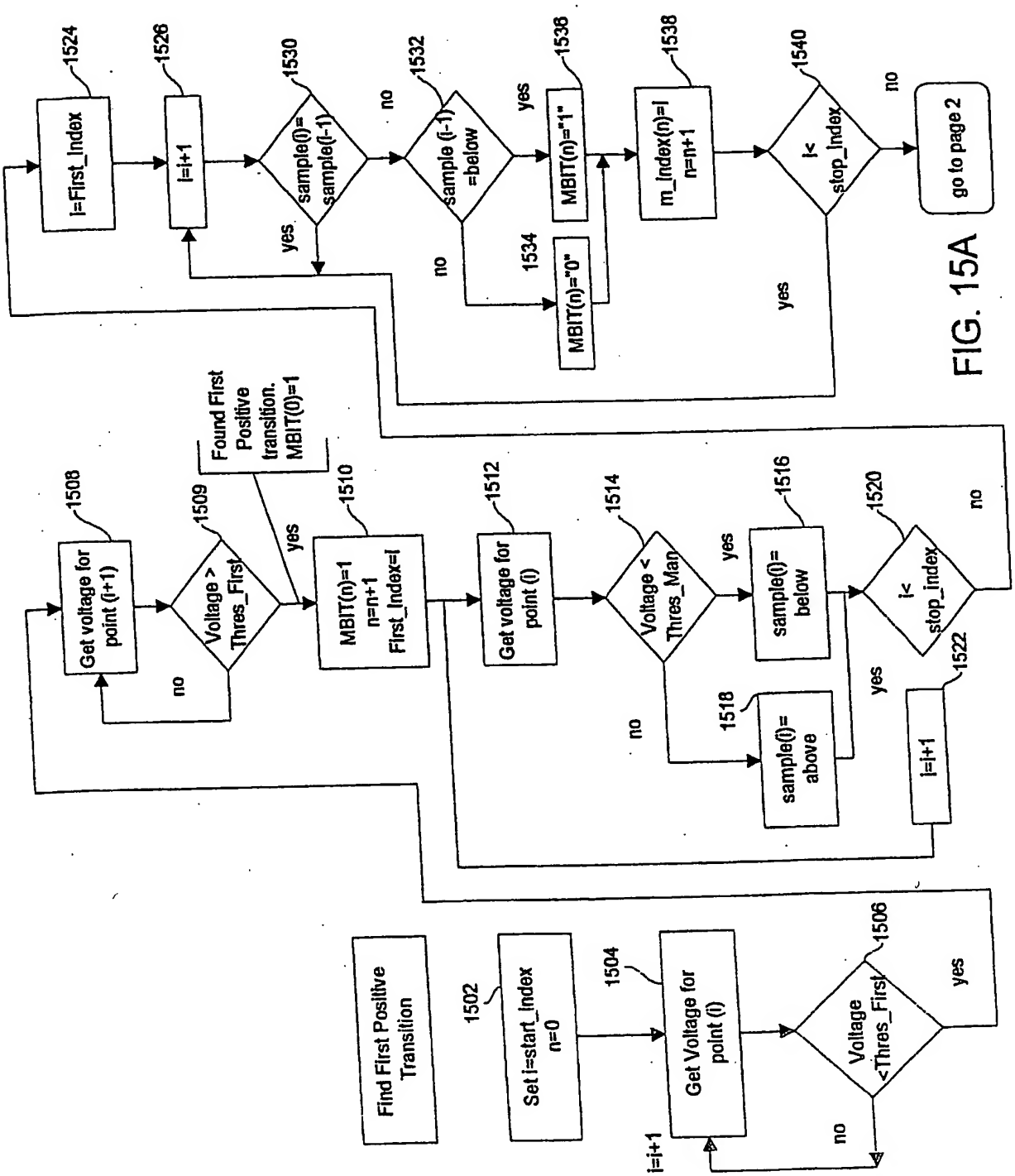

Find First Positive Transition
1502
Set i=start_index n=0
1504
Get Voltage for point (i)
1506
Voltage <Thres_First
yes
no
i=i+1
1508
Get voltage for point (i+1)
1509
Voltage > Thres_First
yes
no
Found First Positive transition. MBIT(0)=1
1510
MBIT(n)=1 n=n+1 First_Index=i
1512
Get voltage for point (i)
1514
Voltage < Thres_Man
yes
no
1516
sample(i)= below
1518
sample(i)= above
1520
i< stop_index
yes
no
1522
i=i+1
1524
i=First_Index
1526
i=i+1
1530
sample(i)= sample(i-1)
yes
no
1532
Sample (i-1) =below
yes
no
1534
MBIT(n)="0"
1536
MBIT(n)="1"
1538
m_index(n)=i n=n+1
1540
i< stop_index
yes
no
go to page 2

FIG. 15A

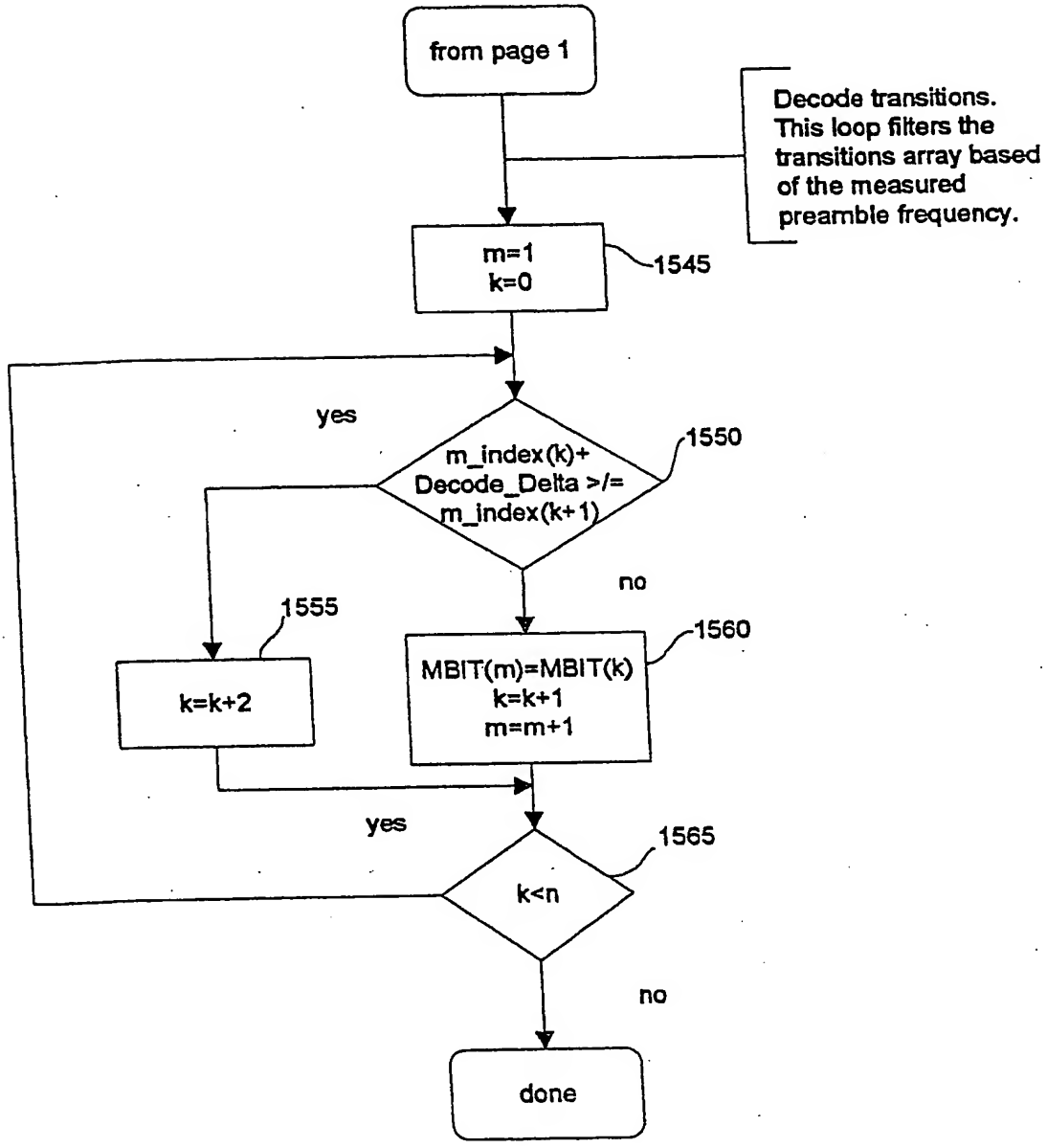

from page 1
Decode transitions. This loop filters the transitions array based of the measured preamble frequency.
m=1
k=0
1545
yes
m_index(k)+ Decode_Delta >/= m_index(k+1)
1550
no
1555
k=k+2
MBIT(m)=MBIT(k)
k=k+1
m=m+1
1560
yes
k<n
1565
no
done

FIG. 15B

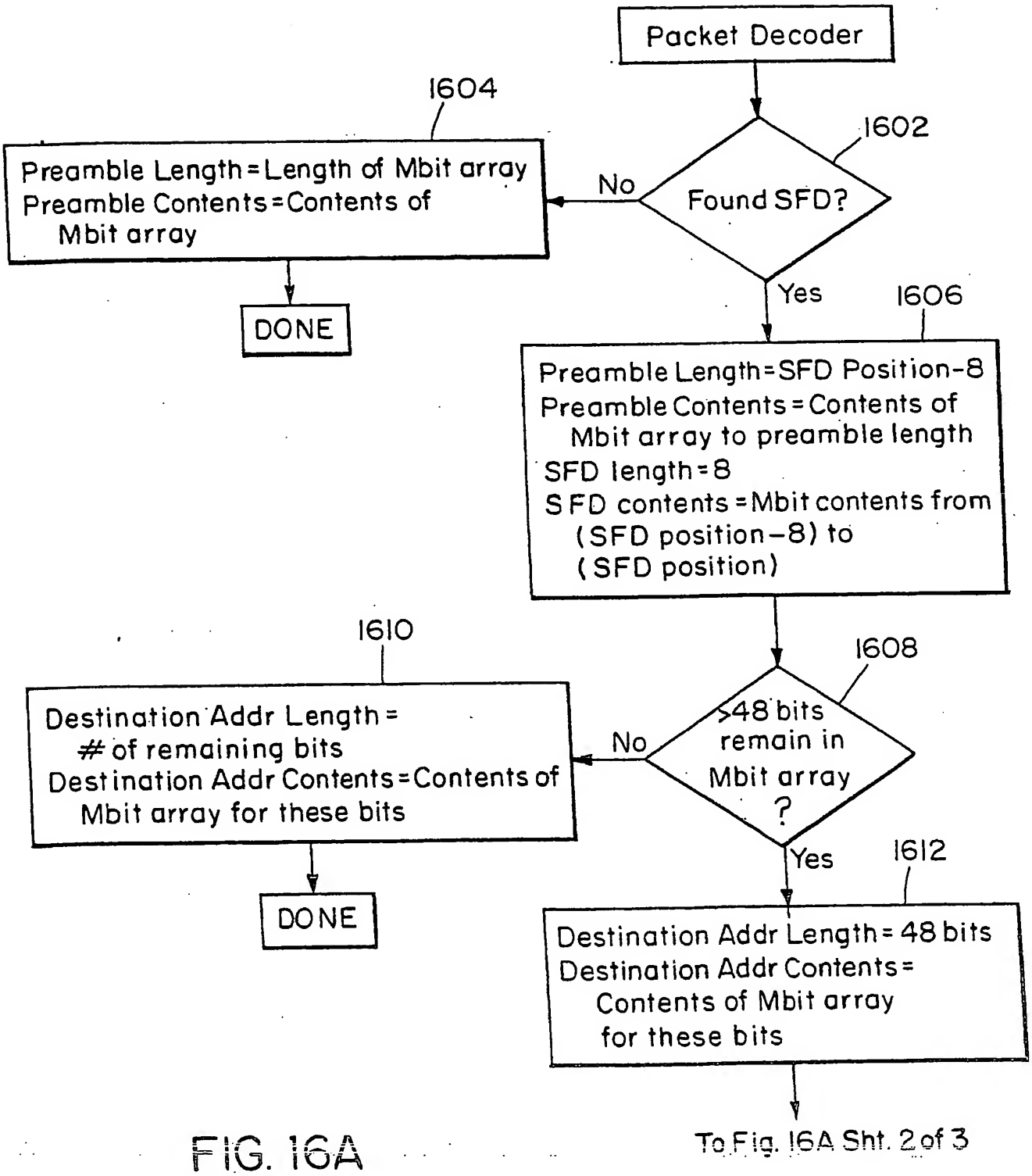


FIG. 16A
Sht. 1 of 3

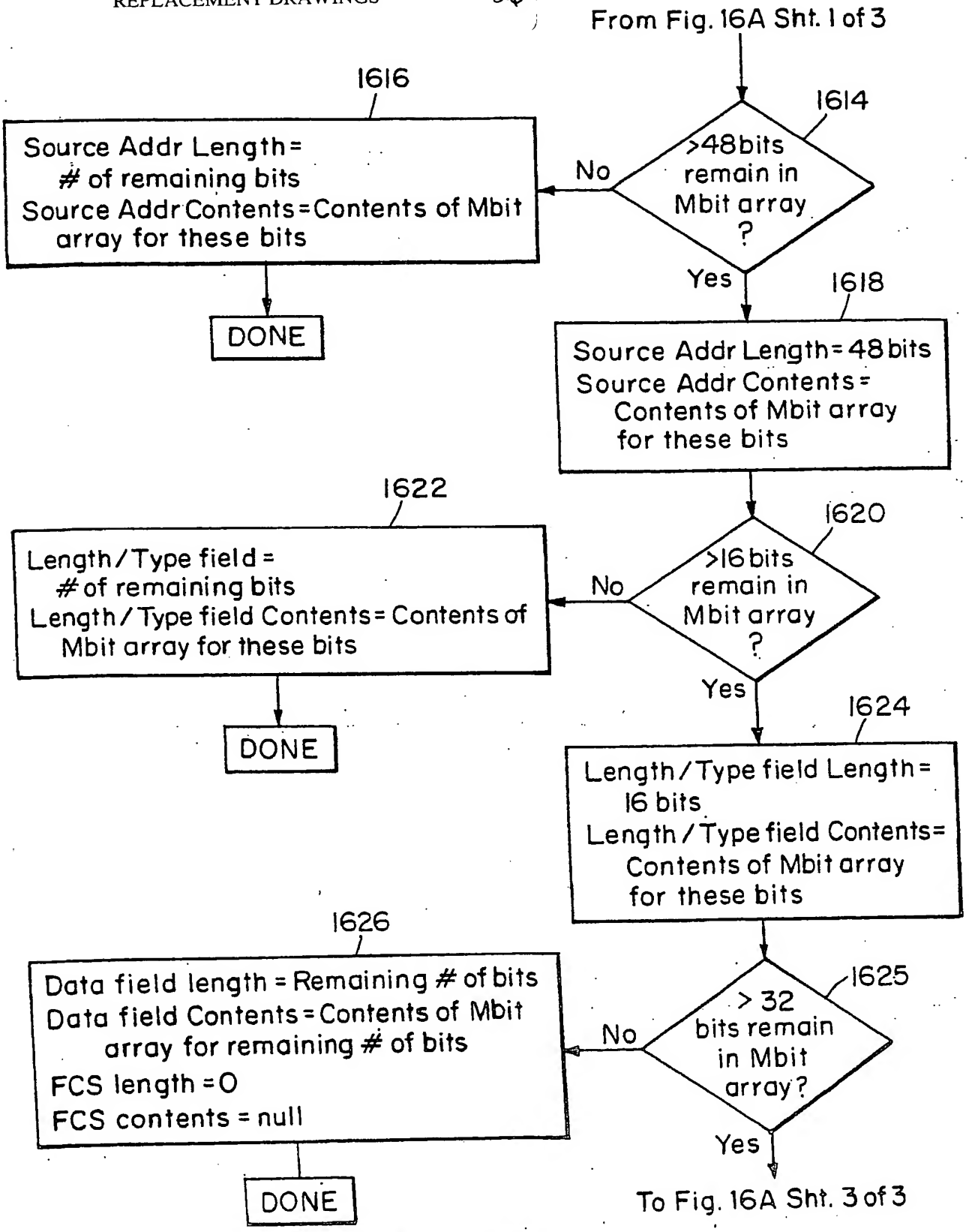


FIG. 16A
Sht. 2 of 3

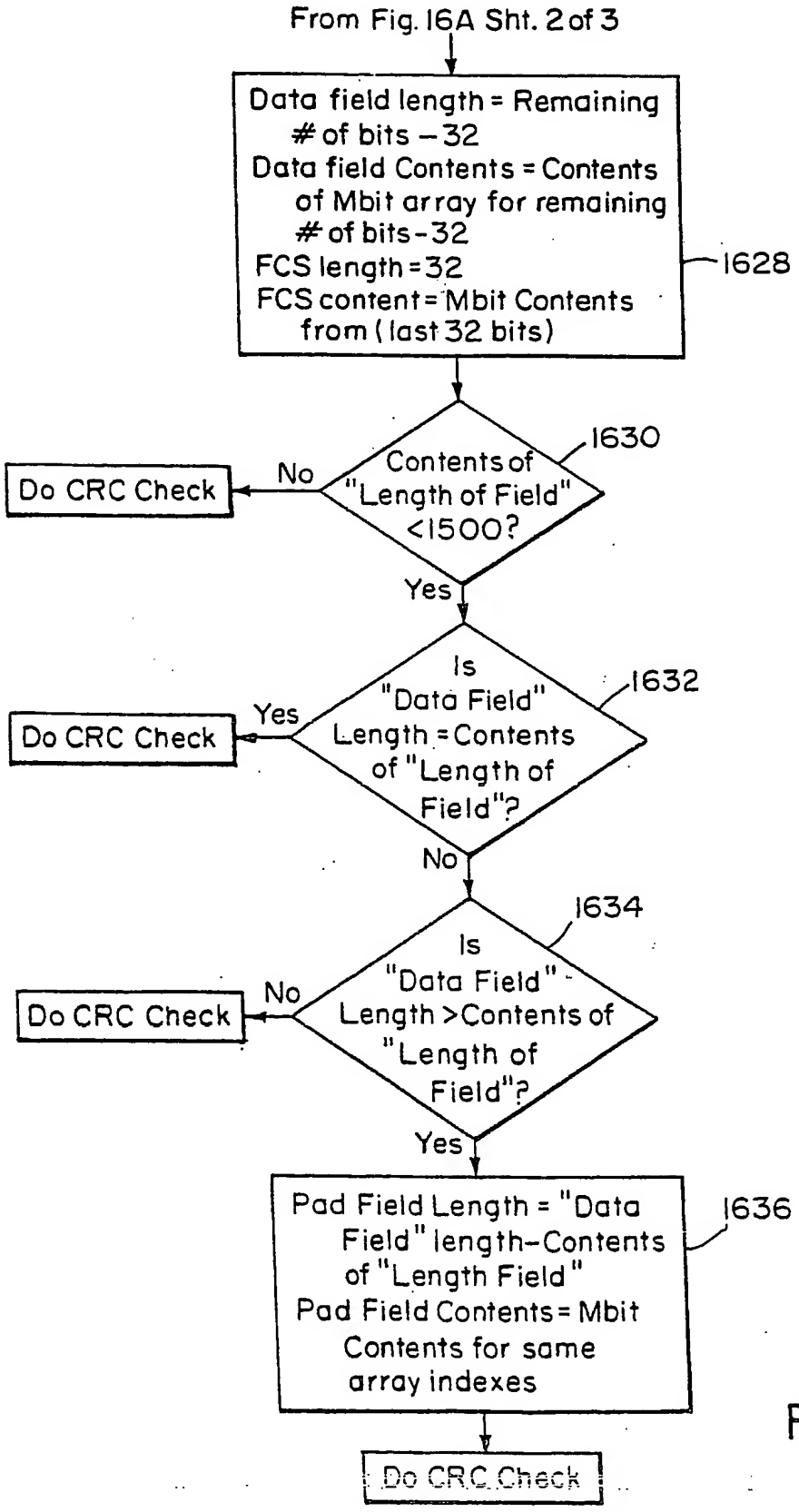


FIG. 16A
Sht. 3 of 3

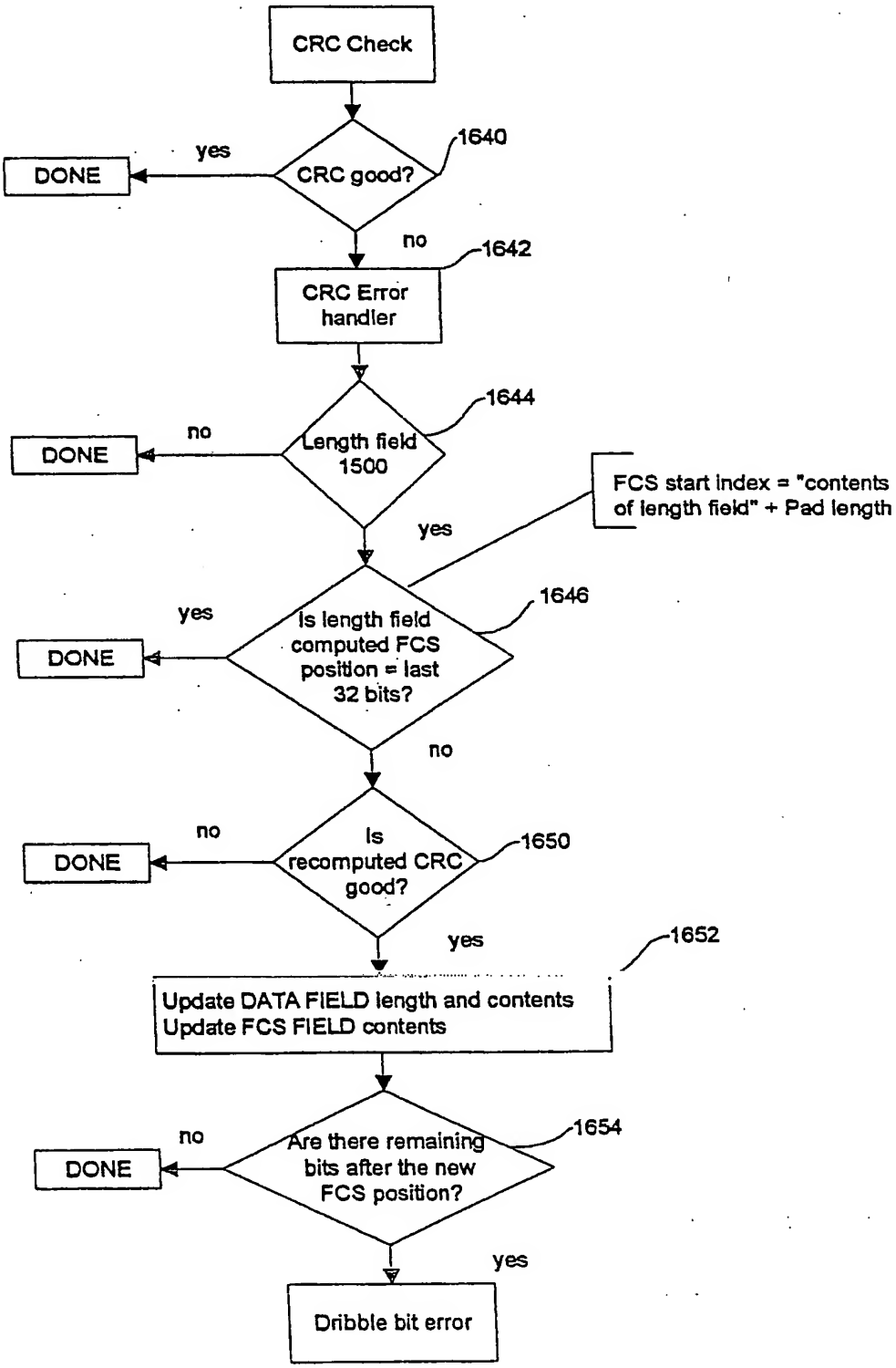

CRC Check
CRC good?
1640
yes
DONE
no
CRC Error handler
1642
Length field 1500
1644
no
DONE
yes
FCS start index = "contents of length field" + Pad length
Is length field computed FCS position = last 32 bits?
1646
yes
DONE
no
Is recomputed CRC good?
1650
no
DONE
yes
1652
Update DATA FIELD length and contents
Update FCS FIELD contents
Are there remaining bits after the new FCS position?
1654
no
DONE
yes
Dribble bit error

FIG. 16B

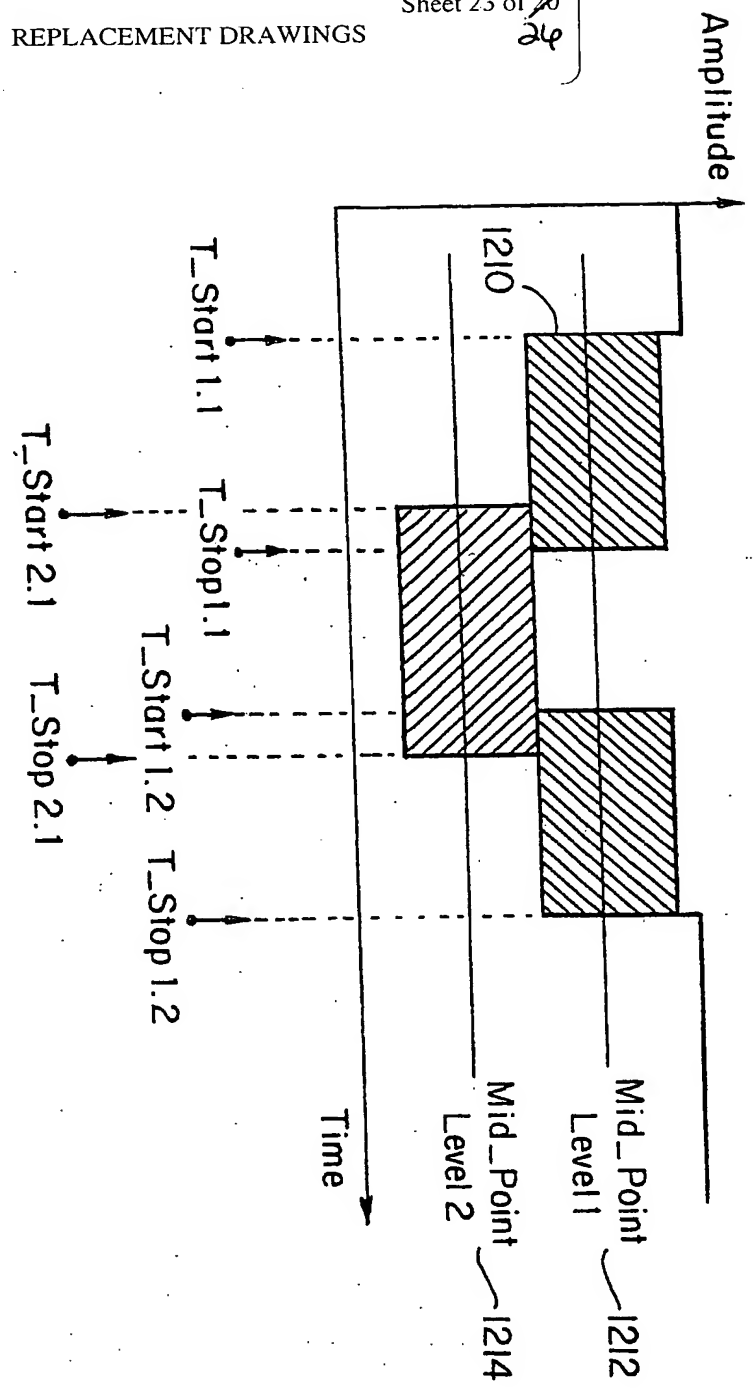

Amplitude
1210
T_Start 1.1
T_Start 2.1
T_Stop1.1
T_Start 1.2
T_Stop 2.1
T_Stop 1.2
Time
Mid_Point Level 2
1214
Mid_Point Level 1
1212

FIG. 17

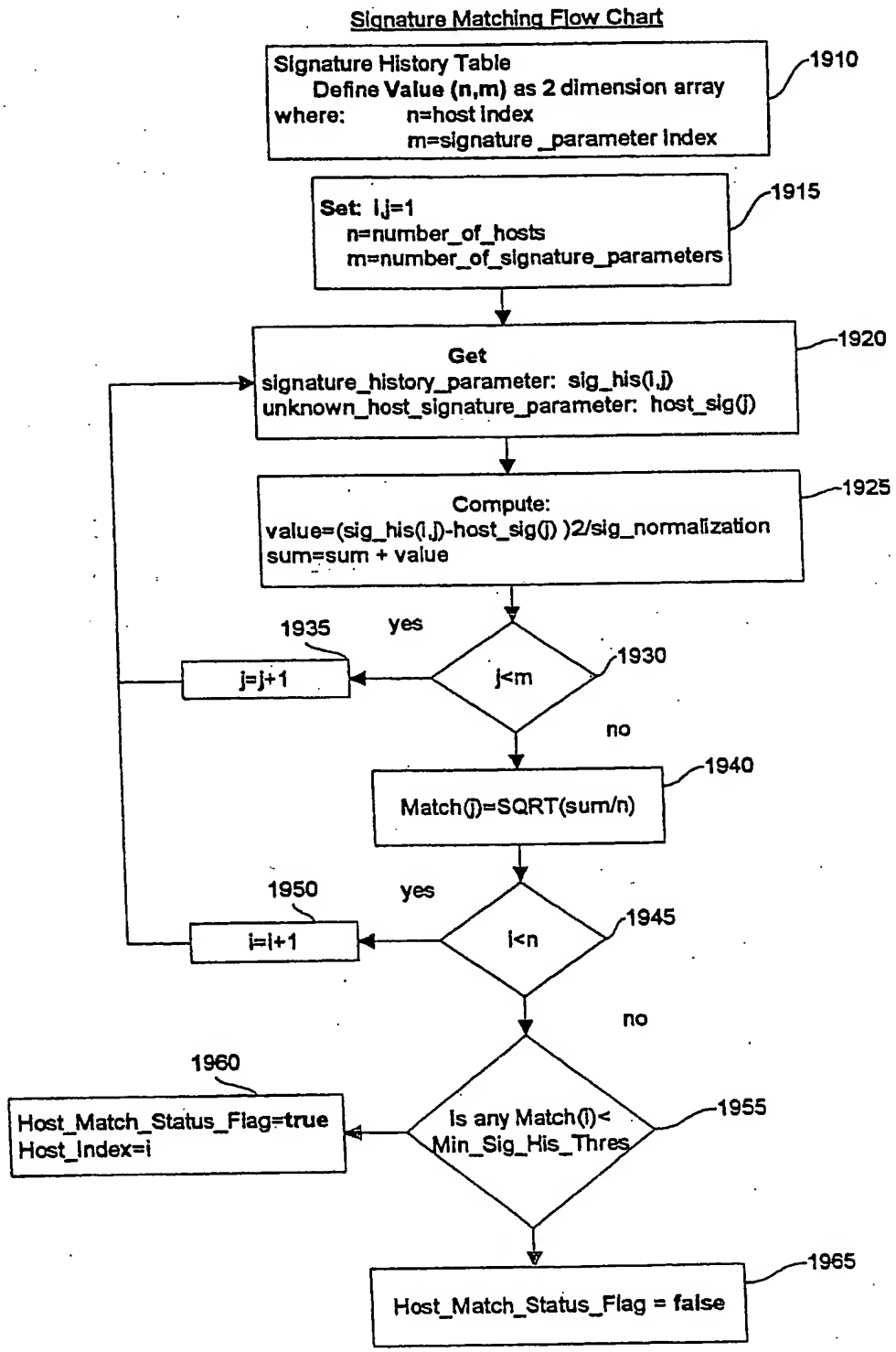

Signature Matching Flow Chart
Signature History Table
Define Value (n,m) as 2 dimension array
where: n=host index
m=signature _parameter index
1910
Set: i,j=1
n=number_of_hosts
m=number_of_signature_parameters
1915
Get
signature_history_parameter: sig_his(i,j)
unknown_host_signature_parameter: host_sig(j)
1920
Compute:
value=(sig_his(i,j)-host_sig(j))2/sig_normalization
sum=sum + value
1925
1935
yes
j=j+1
j<m
1930
no
Match(j)=SQRT(sum/n)
1940
1950
yes
i=i+1
i<n
1945
no
1960
Host_Match_Status_Flag=true
Host_Index=i
Is any Match(i)<
Min_Sig_His_Thres
1955
Host_Match_Status_Flag = false
1965

FIG. 18

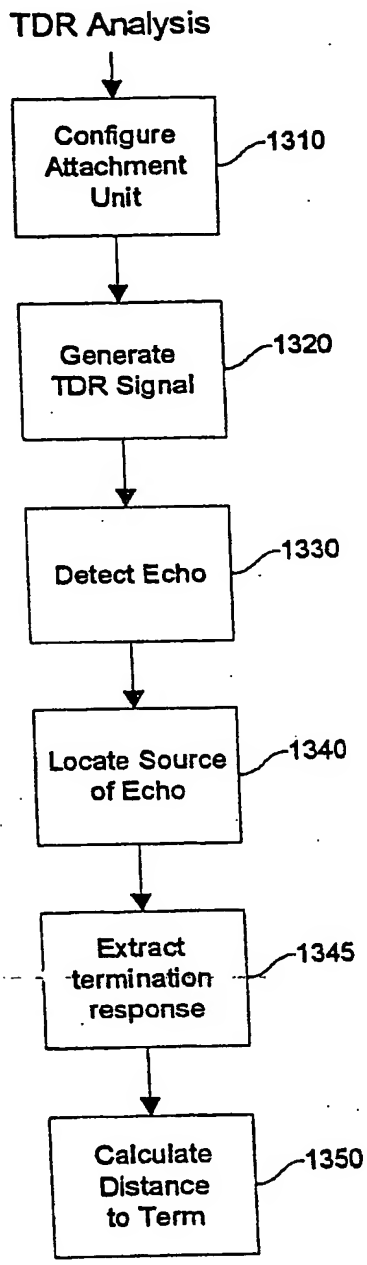

TDR Analysis
Configure Attachment Unit
1310
Generate TDR Signal
1320
Detect Echo
1330
Locate Source of Echo
1340
Extract termination response
1345
Calculate Distance to Term
1350

FIG. 19

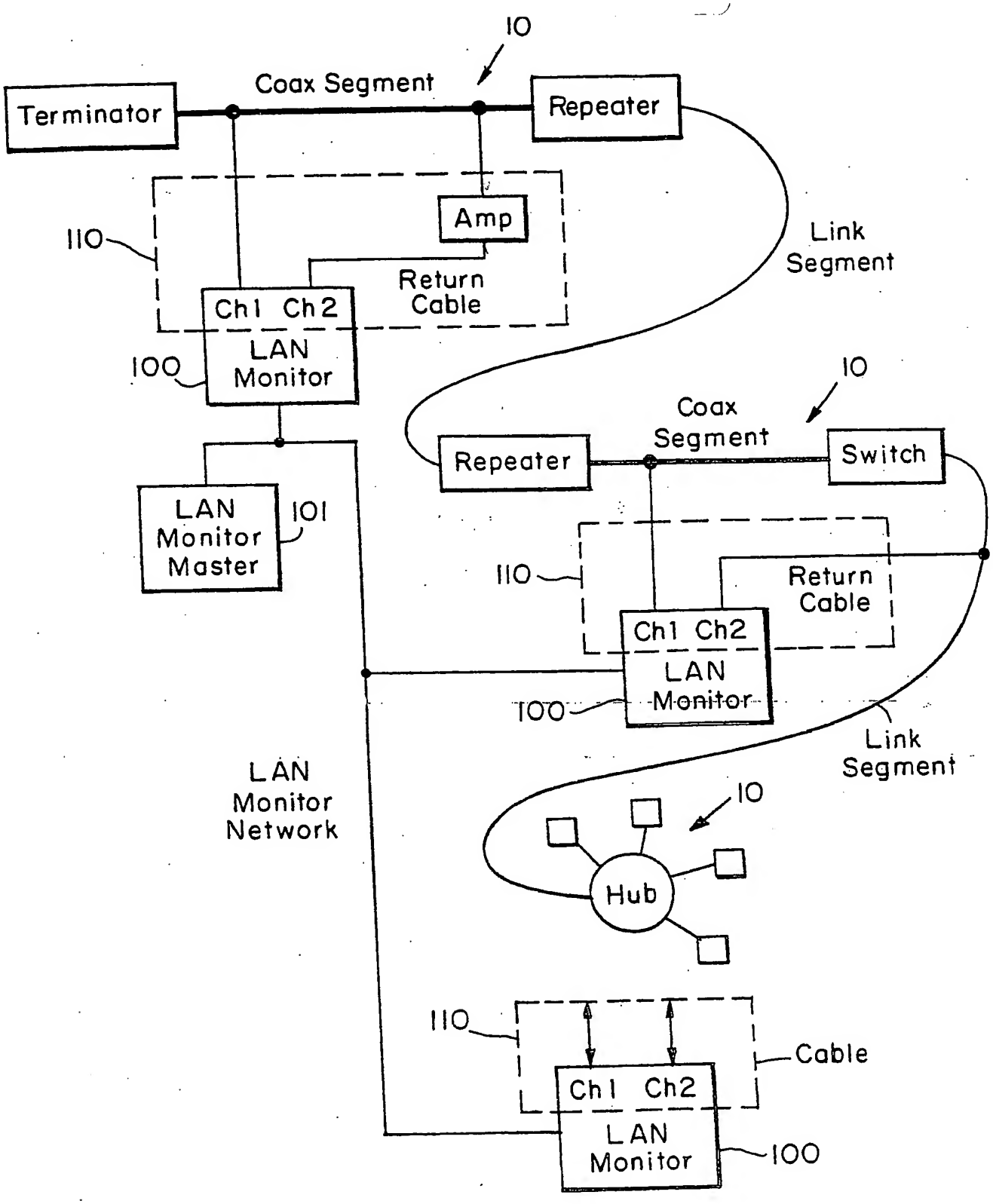

10
Coax Segment
Terminator
Repeater
Amp
110
Link Segment
Return Cable
Ch1 Ch2
LAN Monitor
100
10
Coax Segment
Repeater
Switch
LAN Monitor Master
101
110
Return Cable
Ch1 Ch2
LAN Monitor
100
Link Segment
LAN Monitor Network
10
Hub
110
Cable
Ch1 Ch2
LAN Monitor
100

FIG. 20